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10/525,880	03/21/2005	Marc Bednarz	P/4600-8	4122

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EXAMINER	
ARCIERO, ADAM A	
ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/525,880	BEDNARZ ET AL.	
	Examiner	Art Unit	
	ADAM A. ARCIERO	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 February 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *20-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *02/24/2005 and 04/04/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is the initial Office action based on the Electronically Conductive Reformer Catalyst for a Fuel Cell and Method for Producing application filed on 03/21/2005.

2. Claims 20-37 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 27-28 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. MPEP 2164.01(a) states, "that the claimed invention be enabled so that any person skilled in the art can make and use the invention without undue experimentation. *In re Wands*, 858 F.2d 737, 8USPQ2d 1404 (Fed. Cir. 1988)" (MPEP 2164.01(a)). There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is undue. Only the relevant factors will be addressed in the present claimed invention in the instant application: (a) the level of one of ordinary skill in the art; (b) the amount of direction provided by the inventor; (c) the existence of working examples; (d) the state of the prior art.

(a) The level of one of ordinary skill in the art:

The claims drawn to particles of catalyst material being formed as small islands on the substrate material wherein the small islands of catalyst material have a size on the order of a few nanometers are not described in the specification as to how the small islands of catalyst particles are formed. The specification discloses on page 1, paragraph [0017] that the particles of catalyst material are preferably present in the form of small islands on the substrate material. The specification describes the method for how substrate material, which supports said islands of catalyst, is made on pages 1 and 2, paragraphs [0024]-[0027]. On page 2, paragraph [0036], there is again mention for the catalyst material **7** being present in the form of small islands on the substrate material **6** which can also be shown in Fig. 2. In paragraph [0037] the method for producing the reforming catalyst is described but without mention of formation of the small islands of catalyst material. In order for one of ordinary skill in the art to understand the enablement of these claims, the Applicant should clearly describe how the small islands of catalyst material provided on the substrate material are obtained.

(b) The amount of direction provided by the inventor:

The Applicant gives no details as to how the above small islands of catalyst material are formed on the substrate material, as shown in Fig. 2.

(c) The existence of working examples:

There are no specific working examples provided in the instant application.

(d) The state of the prior art:

The prior art does not disclose, teach, or suggest the formation of small islands of catalyst particles on the supporting substrate material.

Therefore, based upon the above analysis, the claimed particles of catalyst material formed as small islands on the substrate material is not enabled by the present disclosure.

For the purposes of compact prosecution, the size of the small islands of the catalyst will be interpreted as the diameter of the catalysts on the support material.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 29-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention..

7. Claim 29 recites the limitation "the catalyst" in lines 1-2 of the claim. There is insufficient antecedent basis for this limitation in the claim. Claim 29 depends on claim 20 and claim 20 recites an electronically conductive reforming catalyst which comprises a water-adsorbent substrate material and particles of a catalyst material and does not recite the limitation "the catalyst". The Examiner is unclear if "the catalyst" of claims 29-33 corresponds to the reforming catalyst or the catalyst material of claim 20. For examination purposes the Examiner construes “the catalyst” as to be the electronically conductive reforming catalyst of claim 20.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 34-37 are rejected under 35 U.S.C. 102(b) as being anticipated by PATEL et al. (US Patent No. 4,467,050).

As to Claims 34-37, PATEL et al. discloses a method for manufacturing an internal reforming catalyst for a fuel cell (col. 4, lines 34-39). Said internal reforming catalyst comprises a porous catalyst support layer **11** of ceramic or refractory material (col. 4, lines 10-13) and a reforming catalyst material **12** of nickel, which is impregnated into the ceramic support **11** to form the internal reforming catalyst layer **1** (col. 4, lines 25-31 and Fig. 1). PATEL et al. further discloses forming a slurry or mixture containing an emulsion of a solvent and dispersing agent with the ceramic material and electrophoretically depositing said slurry into the support layer **12** (col. 5, lines 20-35). An emulsion is a defined as a colloidal suspension of a liquid in a liquid (Merriam-Webster's Online Dictionary) which reads on the solvent and dispersing agent. A slurry is defined as a watery mixture of insoluble matter (Merriam-Webster's Online Dictionary) which reads on the mixture of the ceramic material with the suspension of the two liquids. The catalytic active material is then impregnated into the support material layer **12** by means of dipping, forming the catalyst material **1** (col. 5, lines 36-48). Said catalytic material **1** is then dried and heated to perform activation of the material

(sintering) which can be done in situ or prior to the fuel cell construction (col. 5, lines 57-68). PATEL et al. discloses just one layer which is formed from a slurry and by dipping and sintering the catalytic material to form the final layer. Furthermore, it is noted a preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See In re Hirao, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and Kropa v. Robie, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). In claim 34, the intended use of the electronically conductive reforming catalyst having a specific arrangement within the fuel cell is not given patentable weight.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 20, 22-23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over ITO et al. (JP 08236129A) in view of KIMURA et al. (US Patent No. 4,983,470).

As to Claims 20 and 22-23, ITO et al. discloses an internal reforming type molten carbonate fuel cell comprising a bipolar plate (bipolar separator) **10**, an anode **3**, cathode **4**, electrolyte matrix **2**, and a corrugated plate (substrate with reforming catalyst) **20** which is placed between the anode **3** and the bipolar plate **10** (Abstract, paragraph [0008] and Fig. 1). A collecting electrode plate (anode current collector) is inserted between said anode **3** and corrugated plate **20** (paragraph [0023]). ITO et al. does not expressly disclose an electronically conductive reforming catalyst which contains particles of a water-adsorbent substrate material.

However, KIMURA et al. teaches a protective material for a molten carbonate fuel cell which comprises a ceramic comprising an oxide capable of chemically reacting with an electrolyte used in said molten carbonate fuel cell (Abstract). The protective material **15** is interposed between the anode **2** and the reforming catalyst **8** (col. 6, lines 51-63 and Fig. 3). Examples of the protective material use a TiO_2 material (col. 5, line 21).

At the time of the invention, a person having ordinary skill in the art would have found it obvious to modify the internal reforming molten carbonate fuel cell of ITO et al. with a protective ceramic oxide material, such as TiO_2, as the corrugated plate (substrate with reforming catalyst) because it is an effective material for preventing the degradation of the reforming catalyst from the electrolyte, as taught by KIMURA et al. (col. 3, lines 3-5).

As to Claim 26, ITO et al. discloses a nickel series marketing catalyst (paragraph [0017]).

13. Claims 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over ITO et al. (JP 08236129A) in view of KIMURA et al. (US Patent No. 4,983,470) as applied to claim 20 above, and further in view of SMITH et al. (US Patent No. 5,139,896).

As to Claim 21, the combination of ITO et al. and KIMURA et al. does not expressly disclose wherein the reforming catalyst has a specific conductivity that exceeds 1S/cm under operating conditions.

However, SMITH et al. teaches of an all ceramic structure for molten carbonate fuel cells. The compositions are selected from transition metal ceramics defined by the formula of $A_xT_yO_z$ where A is an alkali metal, T is a transition metal and O is oxygen. X, y and z can be any value including zero (col. 4, lines 34-50). The TiO_2 ceramic material of ITO et al. and KIMURA et al. falls into this definition. SMITH et al. also teaches that the compositions can also be doped with such cations such as Nb and Mn (col. 2, lines 51-58 and col. 3, line 56-col. 4, line 19). The compositions are doped so as to increase the electrical conductivity thus proving that the conductivity of the ceramic substrate is a result effective variable.

Therefore, according to MPEP 2144.05 [R-5], "A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)." Also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (the

prior art suggested proportional balancing to achieve desired results in the formation of an alloy). SMITH et al. suggests doping to increase conductivity to achieve desired results in the formation of a fuel cell.

As to Claim 24, the combination of ITO et al. and KIMURA et al. does not expressly disclose wherein the substrate material is a water-adsorbent material doped with impurity ions.

However, SMITH et al. teaches of an all ceramic structure for molten carbonate fuel cells. The compositions are selected from transition metal ceramics defined by the formula of $A_xT_yO_z$ where A is an alkali metal, T is a transition metal and O is oxygen. X, y and z can be any value including zero (col. 4, lines 334-50). The TiO_2 ceramic material of ITO et al. and KIMURA et al. falls into this definition. SMITH et al. also teaches that the compositions can also be doped with such cations such as Nb and Mn (col. 2, lines 51-58 and col. 3, line 56-col. 4, line 19).

At the time of the invention, a person having ordinary skill in the art would have found it obvious to dope the ceramic substrate material of ITO et al. and KIMURA et al. with impurity ions such as Nb and Mn so that the reforming catalyst can have an increased conductivity and electronic stability, as taught by SMITH et al. (col. 2, lines 57-58).

14. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over ITO et al. (JP 08236129A) in view of KIMURA et al. (US Patent No. 4,983,470) as applied to claim 20 above, and further in view of SCHULER et al. (US Patent No. 4,983,261).

As to Claims 24 and 25, the combination of ITO et al. and KIMURA et al. teach a substrate material that is a water-adsorbent material for use in an internal reforming type molten carbonate fuel cell. The combination however, does not teach that the substrate material is doped with impurity ions, and more specifically wherein the substrate material comprises at least one of aluminum-doped zinc oxide, indium-doped tin oxide and antimony-doped tin oxide.

However, SCHULER et al. teaches the method of applying a catalyst layer consisting of precious metals and/or precious metal compounds to a substrate of ceramic material. Specifically, wherein a tin oxide (SnO_2) layer that is doped with antimony (Sb) (Abstract). The tin oxide layer is used to support a catalyst which is applied electrolytically to the tin oxide layer by a spraying method (col. 2, lines 63-68). SnO_2 is a water-adsorbent material. SCHULER et al. and ITO et al. are analogous art because they are both concerned with using a water adsorbent substrate material to support a catalyst. At the time of the invention, a person having ordinary skill in the art would have found it obvious to substitute a SnO_2 layer for the TiO_2 substrate because they are recognized as equivalents in providing a water-adsorbent ceramic material, and then dope the SnO_2 layer with antimony so as to increase the electric conductivity, as suggested by SCHULER et al. (col. 2, lines 55-58).

15. Claims 27-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over ITO et al. (JP 08236129A) in view of KIMURA et al. (US Patent No. 4,983,470) as applied to claim 20 above, and further in view of SCHARIFKER et al. (US Patent No. 5,051,156).

As to Claims 27 and 28, the combination of ITO et al. and KIMURA et al. does not expressly disclose wherein the particles of catalyst material are formed as small islands of catalyst material having a particle size on the order of a few nanometers.

However, SHARIFKER et al. teaches of a nickel catalyst (claim 10) which is equivalent to the internal reformer catalyst of ITO et al. as discussed above in claim 26. Said nickel catalyst of SHARIFKER et al. is deposited on a substrate, wherein said nickel catalyst particles have a particle size ranging from 0.0001 microns to about 800 microns. SHARIFKER et al. teaches that the smaller the particle size of the finely dispersed catalyst material, the better the catalytic activity associated with the electrocatalyst (col. 3, lines 53-59). SHARIFKER et al. and ITO et al. are analogous art because they both teach a nickel catalyst material which is a known reforming catalyst.

At the time of the invention, a person having ordinary skill in the art would have found it obvious to form the catalyst material on a substrate so that the small particles represent small islands on the order of a few nanometers, because the smaller the particle size of the catalyst material, the better the catalytic activity associated with the electrocatalyst, as taught by SHARIFKER et al. (col. 3, lines 53-59).

As to Claims 29-32, the combination of ITO et al. and KIMURA et al. does not expressly disclose wherein the catalyst is formed as a layer such as a flat film-like material.

However, SHARIFKER et al. teaches a nickel catalyst (claim 10) for the oxidation of methane and an electrocatalytic process (Title) which is deposited on the electrode as a finely dispersed catalyst layer (flat film-like material) (col. 3, lines 46-61).

At the time of the invention, a person having ordinary skill in the art would have found it obvious to form a nickel catalyst as a finely dispersed film-like layer on the current collector of ITO et al. in view of KIMURA et al. by a means such as painting or an electronically known deposition method (col. 3, lines 22-24) so that the thickness can be as uniform as possible in order to provide effective activity and structural integrity, as suggested by SCHARIFKER et al. (col. 3, lines 59-65).

As to Claim 33, since the catalyst coating is applied to the current collector of ITO et al. in view of KIMURA et al., and the reforming catalyst is arranged directly between the anode current collector and the bipolar separator then the coating that forms the catalyst is also applied to the bipolar separator of the fuel cell.

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 8am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA
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